

## Alterations in maternal-fetal cellular trafficking after fetal surgery.

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**Authors:** Payam Saadai, Tzong-Hae Lee, Geoanna Bautista, Kelly D Gonzales, Amar Nijagal, Michael P Busch, Chong Jai Kim, Roberto Romero, Hanmin Lee, Shinjiro Hirose, Larry Rand, Douglas Miniati, Diana L Farmer, Tippi C Mackenzie

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### Public Summary:

During pregnancy, it is routine to have cells travel between the mother and fetus and fetus and mother. That is, there is bidirectional maternal-fetal 'trafficking' of cells. Changes in fetal-to-maternal cellular trafficking have been reported in prenatal complications, but maternal-to-fetal trafficking has never been studied in the context of fetal intervention, including fetal surgery. We hypothesized that patients undergoing open fetal surgery would have altered maternal-fetal cellular trafficking. We analyzed patients with myelomeningocele (MMC) who underwent open fetal surgical repair, patients with MMC who had routine postnatal repair, and healthy control healthy patients. As an additional control for the fetal operation, trafficking was also analyzed in patients who were delivered by an ex utero intrapartum treatment procedure. Microchimerism---the presence of two genetically distinct and separately derived populations of cells---in maternal blood and cord blood (fetal) was determined using sophisticated laboratory analysis. We found that maternal-to-fetal trafficking was significantly increased in patients who underwent open fetal surgery for MMC compared with healthy controls, patients who underwent postnatal MMC repair, and patients who underwent ex utero intrapartum treatment. There were no differences in fetal-to-maternal cell trafficking among groups. Patients undergoing open fetal surgery for MMC have elevated levels of maternal microchimerism. These results suggest altered trafficking and/or increased proliferation of maternal cells in fetal blood and may have important implications for preterm labor.

### Scientific Abstract:

**BACKGROUND/PURPOSE:** Bidirectional trafficking of cells between the mother and the fetus is routine in pregnancy and a component of maternal-fetal tolerance. Changes in fetal-to-maternal cellular trafficking have been reported in prenatal complications, but maternal-to-fetal trafficking has never been studied in the context of fetal intervention. We hypothesized that patients undergoing open fetal surgery would have altered maternal-fetal cellular trafficking. **METHODS:** Cellular trafficking was analyzed in patients with myelomeningocele (MMC) who underwent open fetal surgical repair (n = 5), patients with MMC who had routine postnatal repair (n = 6), and healthy control healthy patients (n = 9). As an additional control for the fetal operation, trafficking was also analyzed in patients who were delivered by an ex utero intrapartum treatment procedure (n = 6). Microchimerism in maternal and cord blood was determined using quantitative real-time polymerase chain reaction for nonshared alleles. **RESULTS:** Maternal-to-fetal trafficking was significantly increased in patients who underwent open fetal surgery for MMC compared with healthy controls, patients who underwent postnatal MMC repair, and patients who underwent ex utero intrapartum treatment. There were no differences in fetal-to-maternal cell trafficking among groups. **CONCLUSION:** Patients undergoing open fetal surgery for MMC have elevated levels of maternal microchimerism. These results suggest altered trafficking and/or increased proliferation of maternal cells in fetal blood and may have important implications for preterm labor.